

## **OZETTE — OZETTE COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Ozette coastal cutthroat stock complex has been identified as distinct based on geographic distribution of its spawning grounds. This stock complex includes cutthroat in the Ozette River, Ozette Lake and its 12 tributaries as well as in several smaller independent tributaries to the Pacific Ocean. Streams in this area include the Ozette River, Coal Creek, Umbrella Creek, Big River, Crooked Creek, and Siwash Creek. Ozette Lake is 7,787 acres and is the third largest natural lake in Washington. The Ozette River drains Ozette Lake in a northwesterly direction and enters the Pacific Ocean near Cape Alava.

The number of genetically distinct stocks within the Ozette stock complex, and the relationship of this complex to other stocks and stock complexes are unknown. Genetic sampling and analysis are needed to make these determinations.

Spawner distribution is distinct for this stock complex, but specific spawning locations are unknown. Coastal cutthroat probably spawn in the upper reaches of tributaries throughout the drainage. Coastal cutthroat are also found in lowland lakes and beaver ponds in the watershed.

Life histories of coastal cutthroat in the Ozette drainage are probably similar to those described by June (1981) in Bear Creek, a tributary to the Bogachiel River, located south of the Ozette drainage on the Olympic Peninsula. Anadromous cutthroat in Bear Creek spawn from January through March whereas resident cutthroat spawn in April and May (June 1981). For a description of the life history of Bear Creek coastal cutthroat please refer to the Quillayute stock report.

Coastal cutthroat trout are native to the Ozette River drainage and are sustained by wild production.

### **STOCK STATUS**

The status of the Ozette stock complex is Unknown since there is insufficient quantitative information to identify a trend in abundance or survival.

### **FACTORS AFFECTING PRODUCTION**

**Habitat**--Ozette Lake is contained entirely within the boundaries of Olympic National Park. However, the majority of the watersheds entering the lake are owned by private timber companies. Thus the original forest has been converted to managed plantations, and road densities are very high (McHenry et al. 1996). As a result,

STOCK DEFINITION PROFILE for Ozette Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - UNKNOWN



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT?
Anad Riv Entry													No
Anad Spawning													No
Resident													No
Spawning													No

Timings are unknown. These timings are based on those for the Quillayute stock complex.

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

STOCK STATUS PROFILE for Ozette Coastal Cutthroat

STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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STOCK SUMMARY

Stock Origin

**Native**

Production Type

**Wild**

Stock Distinction

**Distribution**

Stock Status

**Unknown**

Screening Criteria

considerable habitat degradation associated with intensive logging along the tributaries of Ozette Lake has occurred. Sediment levels in spawning gravels are among the highest on the Olympic Peninsula, and summer temperatures are elevated above state water quality standards in Umbrella Creek, Crooked Creek, and Big River. Siltation of tributary spawning grounds has caused cementing of gravels and appears to be correlated with the number of logging roads in the basin. The logging road systems, particularly in the upper tributaries, have degraded stream habitat in the western Olympic Peninsula for at least 30 years (McHenry et al. 1996).

**Harvest Management**--Fisheries regulations are designed to minimize harvest impacts on wild production. The current sport fishing regulations in the Ozette system include a 14-inch minimum size limit in the larger mainstem and catch-and-release in the marine waters. These regulations are intended to protect anadromous first-time spawners and some repeat spawners from harvest. Smaller streams within the drainage are open from June 1 through October 31 with a current daily limit of two fish and a minimum size limit of eight inches to protect resident cutthroat, rearing juveniles and outmigrating smolts. Fishing closures during the spawning season in the smaller streams also protect cutthroat. There are no net fisheries targeting Ozette River coastal cutthroat.

**Hatchery**--There is no hatchery program for anadromous or resident cutthroat for the Ozette River system. Sockeye salmon fry are released into Ozette Lake, and it is believed that cutthroat prey heavily on the juvenile sockeye. There have been no hatchery steelhead releases into the Ozette system.

## **QUILLAYUTE — QUILLAYUTE COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Quillayute coastal cutthroat stock complex has been identified as distinct based on the geographic distribution of its spawning grounds. The Quillayute River Basin is composed of four major watersheds encompassing 629 square miles on the west side of the Olympic Peninsula in Washington State. These watersheds are the Sol Duc, Bogachiel, Calawah, and Dickey river systems. They collectively form the Quillayute River, which empties into the Pacific Ocean at LaPush on the Quileute Indian Reservation.

The number of genetically distinct stocks within the Quillayute stock complex and the relationship of this complex to other stocks and stock complexes are unknown. Genetic sampling and analysis are needed to make these determinations. Genetic collections have been analyzed for Cedar and Bear creeks, both Sol Duc tributaries, and for Goodman Creek on the Quillayute River. All collections are significantly different from one another and from other coastal collections.

With the exception of sites located by June (1981) in another Bear Creek, a tributary to the Bogachiel River, specific spawning locations are unknown. Coastal cutthroat probably spawn in the upper reaches of tributaries throughout the drainage and are also found in lowland lakes and beaver ponds throughout the Quillayute system.

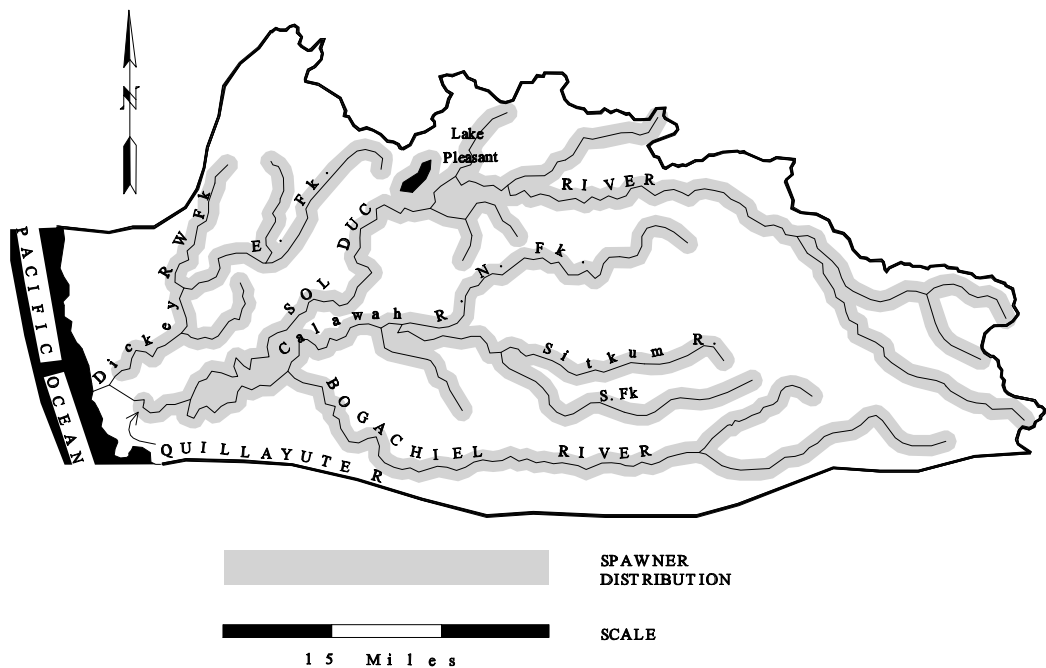
The following life history information on coastal cutthroat in the Quillayute drainage is taken from June's (1981) study of coastal cutthroat in Bear Creek. Bear Creek anadromous cutthroat migrate upstream in December and January. This is similar to the run timing observed for late-entry anadromous cutthroat in Oregon, British Columbia, and elsewhere in Washington. Fish were observed spawning from January through March with peak spawning occurring in February. Similar spawning times have also been observed in Oregon and other Washington streams. Anadromous cutthroat spawned in small tributary streams, choosing the tails of pools for most redd sites with water depths of five to ten cm. Outmigration timing for anadromous cutthroat kelts was generally before the end of April. Mature anadromous spawners averaged 300 mm to 400 mm (12 to 16 inches) in fork length.

Bear Creek resident cutthroat trout spawned in April and May, and the size of redds constructed by resident fish was 50% smaller than that observed for sea-run fish. Timing, location and size of resident redds in Bear Creek compared closely with those reported for other Washington streams (Hunter 1973). Resident cutthroat in Bear

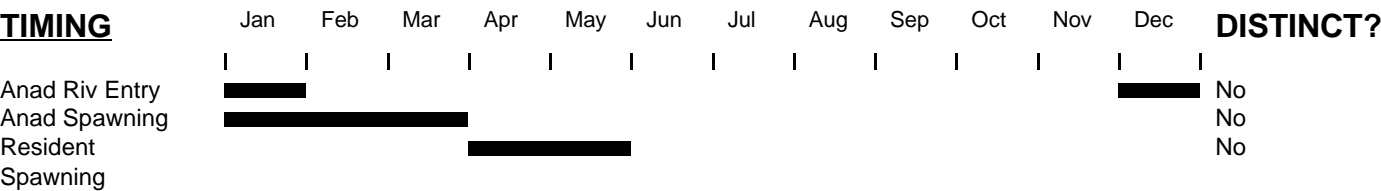
STOCK DEFINITION PROFILE for Quillayute Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - UNKNOWN



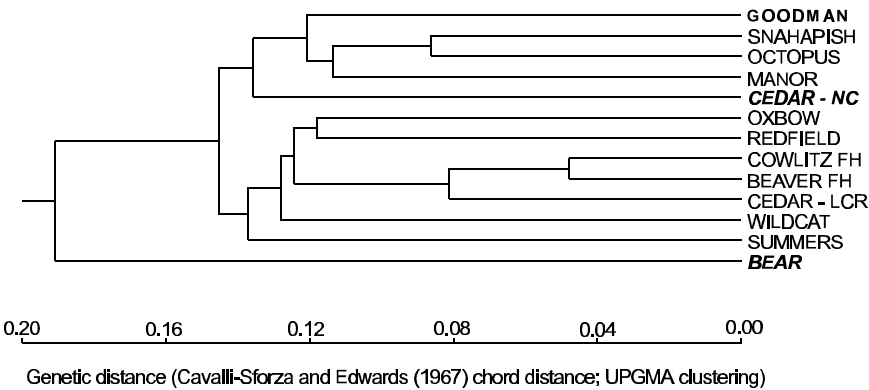
TIMING



BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

**GENETICS** - The Goodman Cr. (N=32) collection, made in 1995, was significantly different from other North Coast collections (33 allzyme-locus G-tests;  $P<0.001$ ). It shows some frequencies similar to those in North Sound collections.



## STOCK STATUS PROFILE for Quillayute Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

Creek spawned as two year-old fish at a mean length of 122 mm and as three year-old fish at mean length of 144 mm. The observed differences in the timing and spawning of resident and sea-run cutthroat in the Quillayute system would reduce the opportunity for interbreeding and possibly maintain genetic isolation between the life history forms. Mean time to emergence was 9 to 10 weeks, peaking in late May to early June, as in California, Oregon, and other Washington areas. Resident cutthroat trout were found to emerge in early July approximately eight weeks after egg deposition.

Four age groups of cutthroat trout were identified in Bear Creek: first-year, second-year, third-year and fourth-year and older (0, I, II, III+). Numbers and density of cutthroat trout in their first year were dependent upon streamflow during spawning migrations. Increases in the number of one to two-year-old fish cutthroat between April and July may be attributed to immigration of fish from overwintering areas. Young-of-the-year fry either moved or were displaced to these areas during the first fall storms in October and November. The large decrease in fish in their third year fish between April and July was due to smolt outmigration.

Density, biomass, and production of cutthroat in Bear Creek were similar to values reported for cutthroat in other Northwest streams. In five study sections in Bear Creek during 1977-78 the average cutthroat density range from 0.016 to 0.195 fry per m<sup>2</sup>, 0.052 to 0.255 juveniles/m<sup>2</sup>, and 0.008 to 0.027 adults/m<sup>2</sup>. The average cutthroat biomass ranged from 0.027 to 0.494 grams of fry/m<sup>2</sup>, 0.578 to 1.003 grams of juveniles/ m<sup>2</sup>, 0.107 to 0.982 grams of adults/m<sup>2</sup>.

Cutthroat juveniles migrated or were displaced downstream to overwintering areas by fall storms but returned upstream to the study areas as second-year fish between April and July. Cutthroat trout moved very little within the study area during the summer months. However, ripe resident fish moved significantly more than unripe fish. Anadromous juveniles in their second and third years, outmigrated in May and June on the decreasing flows of freshets.

Fuss (1978) studied coastal cutthroat in other Quillayute tributaries. A Sol Duc River sample had a high percentage of large third-year fish in the fall primarily because a high percentage within the sample had migrated to the sea in their third year. Almost all fish in their fourth year or older had migrated. Although the sample size was small, Sol Duc River fish enter the ocean at smaller average sizes in their third and fourth year than do fish from other systems (Fuss 1978). From a sample size of 22 Sol Duc River fish, the average length of fish which initially migrated to the sea in their third, fourth and fifth years was 169 mm, 191 mm, and 212 mm, respectively. The percent age composition from this sample was 64% third-year fish, 27% fourth-year fish, and 5% fifth year and older fish. From a sample size of 12 Dickey River fish the average length of third-year and fourth-year initial ocean migrants was 199 mm and 211, respectively. The percent age composition from this sample was 15% third-year fish and 83% fourth year fish.



Cutthroat trout are native to the Quillayute River system and are sustained by wild production.

## **STOCK STATUS**

The status of the Quillayute River coastal cutthroat stock complex is Unknown since there is insufficient quantitative information to identify a trend in abundance or survival.

## **FACTORS AFFECTING PRODUCTION**

**Habitat**--The majority of the Quillayute drainage is used for commercial timber production. Land managers include the Washington Department of Natural Resources, United States Forest Service, the National Park Service, large private timber companies and individual property owners. Industrial development is limited to several small saw mills and the Portac mill near Lake Pleasant. The major population center is in the town of Forks. Suburban and rural residential development has occurred primarily along the lower Sol Duc River and mainstem Calawah River (DeCillis 1992).

Along the North Fork Calawah River and Sol Duc River tributaries, riparian habitat has been extensively converted from conifers (spruce and hemlock) to hardwoods (alder) as a result of logging. Alder typically provides short-lived in-stream large woody debris compared with conifers. Throughout the basin, road construction and timber harvest have resulted in excessive erosion, mass wasting, and sedimentation of tributaries and mainstem rivers.

The Sol Duc River has been impacted by high levels of sedimentation as a result of road construction associated with timber harvest and a history of intense fires. The lower-gradient reaches downstream have been unable to transport the increased sediment, resulting in stream bed aggradation and frequent channel migration and braiding.

There is very little woody debris in the aquatic ecosystem as a result of these activities. Consequently the number of pools and amount instream cover for fish have been reduced.

Decreases in salmonid production resulting from changes in habitat quality and quantity have not been directly measured in the Quillayute drainage (DeCillis 1992). Given the reduced amount of harvestable timber due to environmental restrictions and past rates of harvest, the watershed may now be entering a period of dormancy and/or recovery in some basins. Changes in hydrology, sediment input and temperature will occur as replanted conifers mature and roads are abandoned. However, streams currently lacking adequate riparian zones for the recruitment of large wood debris present a more persistent long-term problem. Major log haul routes with multiple stream crossings and improper drainage will remain pathways for sediment transport.

Along the Oregon coast the Alsea Watershed Study evaluated the effects of timber harvest on streams and their salmonid populations. The long-term study compared an unlogged control watershed with one that was completely clear-cut and another that was patch-cut with buffer zones left along the main channel (Hicks et al. 1991). Cutthroat resident in the clear-cut basin during the late summer decreased to about one-third of their prelogging abundance immediately following logging. Their numbers remained low for the entire postlogging study period. Abundance of cutthroat did not change in the patch-cut or control streams. However, in Carnation Creek, British Columbia, cutthroat smolt abundance did not change following logging (Hartman 1987).

**Harvest Management**--Fisheries regulations are designed to minimize harvest impacts on wild production. The current sport fishing regulations in the Quillayute system include a two-fish daily limit with a 14-inch minimum size limit in the larger mainstem and in the marine waters. This regulation is intended to protect anadromous first-time spawners and some repeat spawners from harvest. The smaller streams are open from June 1 through October 31 with a current daily limit of two fish and a minimum size limit of eight inches to protect resident cutthroat, rearing juveniles and outmigrating smolts. Fishing closures during the spawning season in the smaller streams also protect resident females. There are no net fisheries targeting Quillayute River coastal cutthroat.

**Hatchery**--There is no hatchery program for anadromous or resident cutthroat for the Quillayute River system. Releases of hatchery-origin coho fry in streams can reduce the production of cutthroat in the system. Juvenile coho salmon and coastal cutthroat are potential competitors for food and space during the summer season of low stream flows (Glova and Mason 1977). Significant coho fry releases occurred basin-wide in the mid-1980s. This program was eliminated in 1990 because of poor adult returns (WDFW and WWTIT 1994). Tripp and McCart (1983) found that both young-of-the-year and older cutthroat trout populations were adversely affected by the stocking of coho fry. The greatest effects on the survival of cutthroat were associated with high coho stocking densities. Also, high densities and early stocking of coho fry both slowed the growth of cutthroat fry, presumably as a result of interspecific competition.

Approximately 15,000 to 220,000 hatchery winter steelhead smolts and 50,000 hatchery summer steelhead smolts are stocked into the Quillayute system each year. Steelhead smolts are stocked in the lower watershed and migrate downriver to the ocean quickly and therefore should have minimal impact on river-dwelling cutthroat populations. Juvenile steelhead move offshore soon after entering the ocean and begin to move northward as they move away from the coasts of Oregon and Washington (Burgner et al. 1992). The rapid movement of juvenile steelhead to offshore waters reduces interspecific competition with anadromous cutthroat in near-shore waters.

## **HOH — HOH COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

Hoh coastal cutthroat are considered a distinct stock complex based on the geographic distribution of their spawning grounds. The Hoh River is the third largest drainage on the Olympic Peninsula with a total length of 56.1 miles and a watershed area of 299 square miles, 65 percent of which lies within the boundaries of Olympic National Park. The national park boundary on the mainstem Hoh and South Fork Hoh begins at river miles 29.6 and 5.3, respectively, and the upstream anadromous limits for the Hoh River are at RM 48 at Falls Creek and at RM 13 on the South Fork Hoh. The Hoh River drains the east, north and west slopes of Mt. Olympus and is influenced by six active glaciers (McHenry et al. 1996).

The mainstem and South Fork Hoh River valleys are strongly U-shaped, due to glacial carving, and a series of relict river terraces influences the tributaries. Four distinct riverine habitats strongly affect juvenile fish production: (1) main river channel (2) side-channel (3) terrace tributaries and (4) valley tributaries (Sedell et al. 1984). Side channels are subsidiary channels to the main river which are located within the active exposed lower flood plain. Stable side channels are protected at their upstream ends by large woody debris, boulders, bedrock, or living vegetation. Terrace tributaries result from spring networks on the flat valley floor and from tributaries draining the valley side-slopes and continuing across the terraces to the main river on the South Fork Hoh River. Valley-wall tributaries are second- or third-order streams that drop rapidly off the side slopes or valley wall and then enter a larger stream or river.

The number of genetically distinct stocks within the Hoh stock complex and the relationship of this complex to other stocks and stock complexes are unknown. Genetic sampling and analysis has not been done on Hoh River cutthroat.

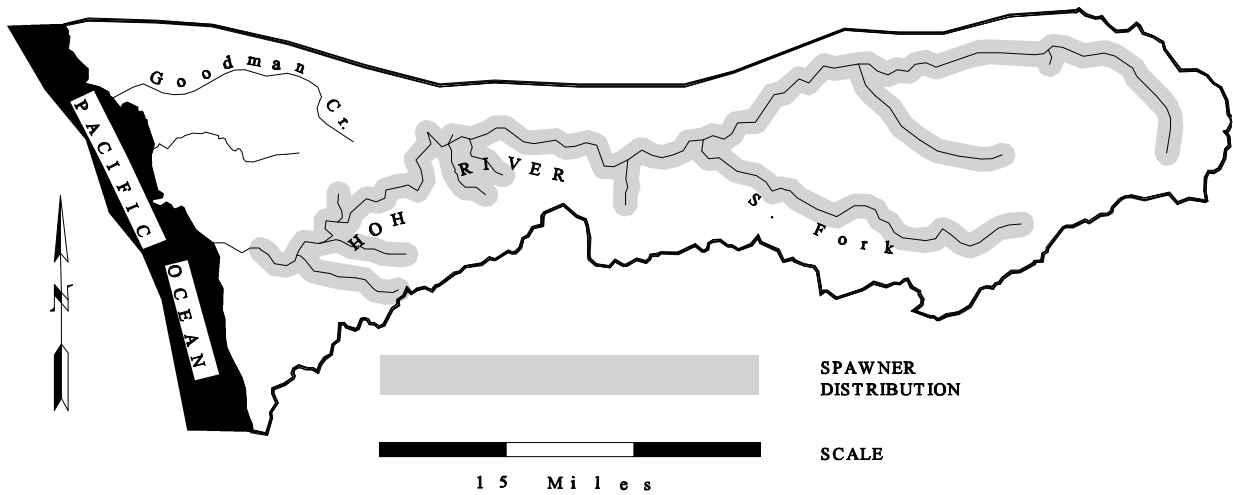
Coastal cutthroat trout are native to the Hoh River drainage. Spawner distribution is distinct for this stock complex, but specific spawning locations are unknown. Coastal cutthroat most likely spawn in the upper reaches of tributaries throughout the drainage. Coastal cutthroat are also found in lowland lakes and beaver ponds in the watershed.

Life histories of coastal cutthroat in the Hoh River drainage are probably similar to those described by June (1981) in Bear Creek, a Bogachiel River tributary with anadromous cutthroat entering the river in December and January and spawning from January through March. Resident cutthroat spawn in April and May (June 1981). For a more complete description of the life history of Bear Creek coastal cutthroat, please refer to the Quillayute River stock report.

STOCK DEFINITION PROFILE for Hoh Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - UNKNOWN



<b><u>TIMING</u></b>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	<b>DISTINCT?</b>
Anad Riv Entry	■											■	No
Anad Spawning	■	■	■	■	■	■	■	■	■	■	■	■	No
Resident Spawning				■	■	■	■	■	■	■	■	■	No

Timings are unknown. These timings are based on those for the Quillayute stock complex.

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

## STOCK STATUS PROFILE for Hoh Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

Hoh River first-time outmigrants were fish in their third (22%) and fourth (78%) years (Fuss 1978). The average length of third-year and fourth-year initial ocean migrants from a sample of 18 fish was 180 mm and 224 mm, respectively.

Hoh coastal cutthroat are native and are sustained by wild production.

## **STOCK STATUS**

The status of the Hoh River coastal cutthroat stock complex is Unknown because there is insufficient quantitative information to identify a trend in abundance or survival.

In 1980 Sedell et al. (1984) reported cutthroat densities of 0.05 fish/m<sup>2</sup> in terrace tributaries and 0.02 fish/m<sup>2</sup> in stable side-channels. In 1978 and 1980 cutthroat densities were 0.05/m<sup>2</sup> and 0.01/m<sup>2</sup> in valley-wall tributaries, respectively.

## **FACTORS AFFECTING PRODUCTION**

**Habitat**--The Washington Department of Natural Resources initiated an aggressive logging campaign designed to rapidly convert the ancient forest to tree farms during the 1960s and 1970s in the Hoh Basin (McHenry et al. 1996). The logging road systems particularly in the upper tributaries have degraded stream habitat in the western Olympic Peninsula for at least 30 years. From 1981 to 1990 a total of 139 separate mass wasting events occurred along the South Fork Hoh River. In the South Fork Hoh River and estimated 34 percent of the sediment from the slope failures from 1989 to 1990 ended up directly in salmonid habitat of the South Fork Hoh River. Tributaries and side channels had fine sediment (<0.85 mm) levels in spawning gravels of 41 and 21 percent, respectively. Compared to streams in Olympic National Park similar habitats averaged 9.7 and 12.7 percent fine sediment in tributaries and side channels, respectively. In the South Fork Hoh River, macroinvertebrate abundance and diversity were 40 to 75 percent less than in similar habitats in Olympic National Park (McHenry 1991).

Sedell et al. (1984) showed that virtually all juvenile coho salmon and cutthroat trout and 87 percent of juvenile steelhead reared in off-channel habitats along the valley floor of the South Fork Hoh River.

Along the Oregon coast the Alsea Watershed Study evaluated the effects of timber harvest on streams and their salmonid populations. The long-term study compared an unlogged control watershed with one that was completely clear-cut and another that was patch-cut with buffer zones left along the main channel (Hicks et al. 1991). Cutthroat resident in the clear-cut basin during the late summer decreased to about one-third of their prelogging abundance immediately following logging. Their numbers remained low for the entire postlogging study period. Abundance of cutthroat did not change in the patch-cut or

control streams. However, in Carnation Creek, British Columbia cutthroat smolt abundance did not change following logging (Hartman 1987).

**Harvest Management**--Fisheries regulations are designed to minimize harvest impacts on wild production. The current sportfishing regulations on the Hoh River have a two-fish daily limit with a 14-inch minimum size limit in the larger mainstem and in the marine waters. This regulation is intended to permit most female anadromous cutthroat to spawn at least once prior to harvest. The smaller streams are open from June 1 through October 31 with a current daily limit of two fish with a minimum size of eight inches to protect resident fish, rearing juveniles and outmigrating smolts. Fishing closures during the spawning season in the smaller streams also protect cutthroat. There are no net fisheries targeting Hoh River coastal cutthroat.

**Hatchery**--There is no hatchery program for anadromous or resident cutthroat for the Hoh River system. Only limited hatchery activity has occurred with salmon stocks in the Hoh River, and it probably does not affect cutthroat production. Approximately 50,000 hatchery winter steelhead smolts are stocked into the Hoh system each year. Steelhead smolts are released into the mainstem and migrate downriver to the ocean quickly and probably have minimal impact on cutthroat populations. Juvenile steelhead move offshore soon after entering the ocean and begin to move northward as they move westward from the coasts of Oregon and Washington (Burgner et al. 1992). The rapid movement of juvenile steelhead to offshore waters reduces interspecific competition with anadromous cutthroat in near-shore waters.





## **QUEETS — QUEETS COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Queets coastal cutthroat stock complex has been identified as distinct based on geographic distribution of its spawning grounds. The glacially-influenced Queets River originates on the southern slopes of Mt. Olympus and is the second largest drainage on the Olympic Peninsula with a total length of 51.4 miles. The upper Queets River flows through a U-shaped valley within lands managed by Olympic National Park. A mile-wide river corridor of Olympic National Park land continues to protect the Queets downstream to RM 6.8 where the river enters the Quinault Indian Reservation. Major tributaries to the Queets River include the Clearwater River, Salmon River, Sams River and Matheny Creek.

The number of genetically distinct stocks within the Queets stock complex and the relationship of this complex to other stocks and stock complexes are unknown. For genetic analysis Queets cutthroat were represented by three samples, Snahapish River, Manor and Octopus creeks. All three collections were significantly different from one another and from other North Coast cutthroat collections.

Life histories on Queets coastal cutthroat are probably similar to those described by June (1981) in his Bear Creek (Bogachiel River tributary) study, with anadromous river entry in December and January, anadromous spawning from January through March and resident cutthroat spawning in April and May.

Spawning distribution of coastal cutthroat occurs in the upper reaches of tributaries throughout the drainage. Edie (1975) identified the uppermost zone in the basin as the domain of coastal cutthroat. The cutthroat zone in the Clearwater River consists of the headwaters of most tributaries with gradients of 2% to 6% and one to 10 feet wide. The cutthroat zone is infrequently inaccessible to sea-run fish and inhabited mainly by resident cutthroat. Coastal cutthroat are also found in lowland lakes and beaver ponds in the watershed.

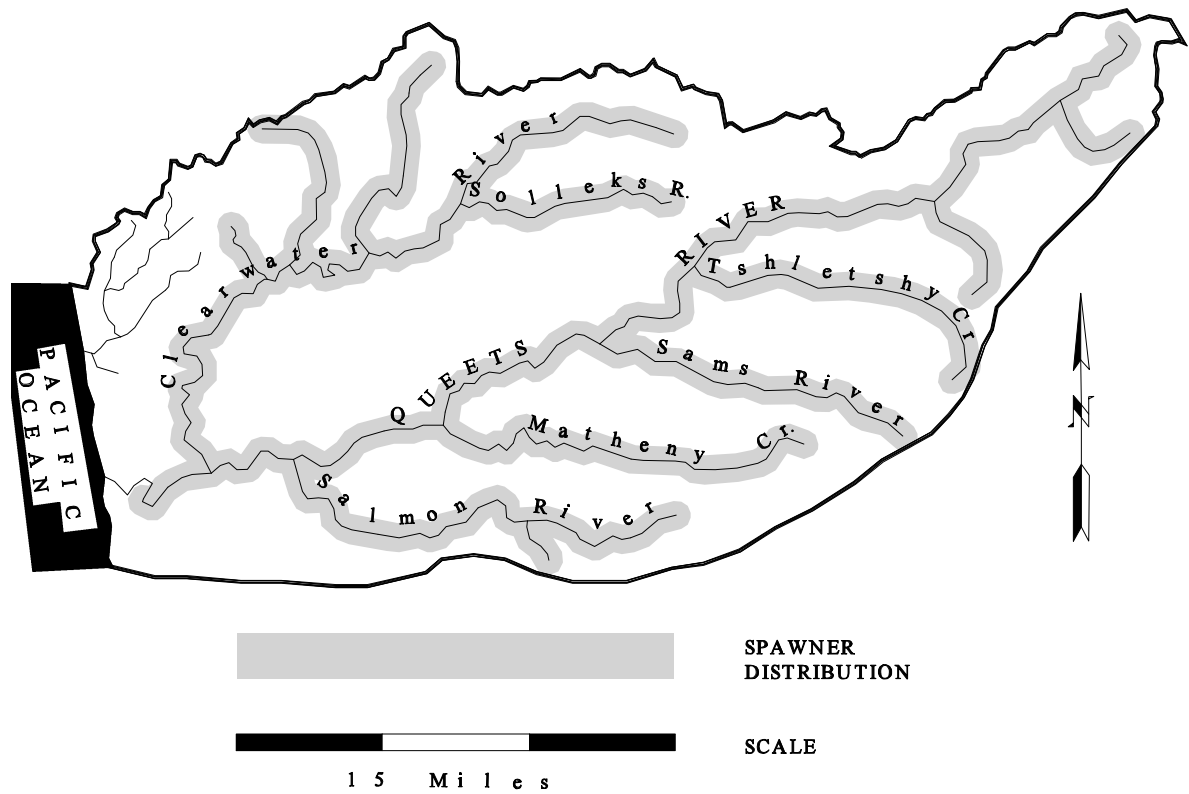
The Snahapish River is a major tributary of the lower Clearwater River and is a large coastal cutthroat producer. Fuss (1978) found that cutthroat smolts ranged from 148 mm to 212 mm in length and consisted primarily of fish in their fourth year. From a sample size of 24 Clearwater River fish the average length of third-year, fourth-year, fifth-year initial ocean migrants was 168 mm, 220 mm, and 235 mm, respectively. The percent age composition from this sample was 33% third-year fish, 63% fourth-year fish, and 4% fifth-year fish.

Sedell et al. (1984) estimated cutthroat densities during 1981 in the upper Queets River from four major habitat types. The cutthroat densities for each habitat type were: (1)

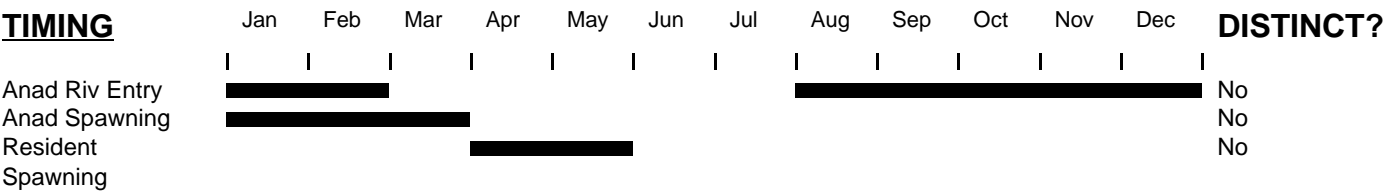
STOCK DEFINITION PROFILE for Queets Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - UNKNOWN



TIMING

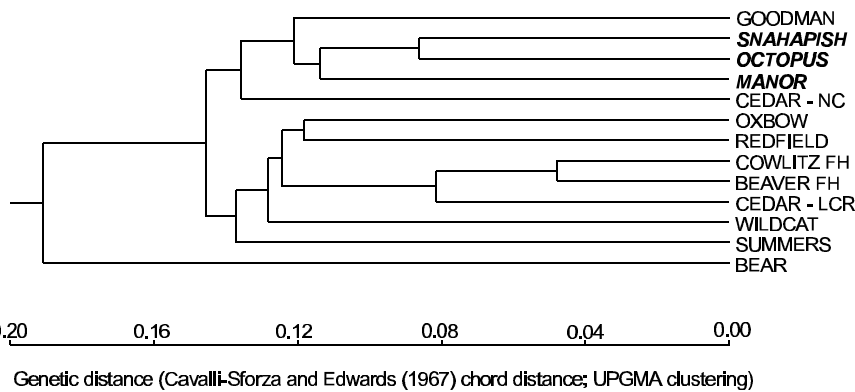


Timings are unknown. These timings are based on those for the Quillayute stock complex.

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

**GENETICS** - The Snahapish (1995, N=56), Manor Cr. (1997, N=31) and Octopus Cr. (1997, N=42) collections were significantly different from each other and from other North Coast collections (33 allozyme-locus G-tests;  $P<0.001$ ). The Snahapish and Goodman Cr. (Quillayute stock complex) collections also differed at microsatellite DNA loci (6-locus G-tests;  $P<0.0001$ ).



## STOCK STATUS PROFILE for Queets Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

terrace tributaries (0.04/m<sup>2</sup>; (2) side channels (0.004/m<sup>2</sup>); (3) lower valley-wall tributaries (0.05/m<sup>2</sup>); (4) major tributary channels (0.001/m<sup>2</sup>).

Coastal cutthroat trout in the Queets River drainage are native and are sustained by wild production.

## **STOCK STATUS**

The status of the Queets River coastal cutthroat stock complex is Unknown because there is insufficient quantitative information to identify a trend in abundance or survival.

## **FACTORS AFFECTING PRODUCTION**

**Habitat**--The majority of the watersheds that lie outside Olympic National Park have been extensively logged and roaded, particularly Matheny Creek and Sams River (McHenry et al. 1996). Road density is positively correlated with fine sediment levels in streambeds including spawning gravels (McHenry et al. 1996). The Clearwater watershed is managed almost entirely for commercial timber production by the Washington Department of Natural Resources and various private timber owners. Approximately 75 percent of the basin has been harvested at least once. Miles of logging roads were constructed to access the timber, and substandard road-building techniques have caused stream habitat to be degraded. Two massive landslides occurred along Stequaleho Creek, a tributary of the upper Clearwater River during the spring of 1971. Cederholm and Reid (1987) reported sediment levels in Clearwater tributaries were 0.5 to 2.4 times higher than in unlogged Olympic National Park streams.

Bisson and Sedell (1984) found streams in logged watersheds contained different species compositions compared to old growth area, with higher proportions of first-year steelhead and cutthroat and lower proportions of first-year coho salmon and second-year and third-year cutthroat compared to streams in old growth forests. Shifts in species and age composition were related to habitat changes that resulted from timber harvesting and debris removal from the channels. Increases in the proportional abundance of underyearling steelhead and cutthroat trout after clearcutting is possibly explained by the preference of these fishes for riffle habitat, while relative decline of coho and older cutthroat may have resulted from the loss of pool volume and large, stable woody debris for cover.

Lestelle and Cederholm (1984) studied the effects of removing in-stream woody debris on resident cutthroat population in two headwater streams of the Clearwater River. Clearing the stream had little or no effect on numbers and biomass of cutthroat immediately after alteration and prior to winter. A decline in numbers of overwintering trout was apparently associated with habitat instability brought on by the removal of large woody debris from the

stream channel. Within one year of wood removal, the cutthroat trout population returned to pretreatment levels.

**Harvest Management**--Fisheries regulations are designed to minimize harvest impacts on wild production. The current sportfishing regulations in the Queets drainage include a two-fish daily limit with a 14-inch minimum size limit in the larger mainstem and catch-and-release in marine waters. This regulation is intended to permit female anadromous cutthroat to spawn at least once prior to harvest. The smaller streams are open from June 1 through October 31, with a current daily limit of two fish and a minimum size limit of eight inches to protect resident fish, rearing juveniles and outmigrating smolts. Fishing closures during the spawning season in the smaller streams also protects resident spawning cutthroat. There are no net fisheries targeting Queets coastal cutthroat.

**Hatchery**--There is no hatchery program for anadromous or resident cutthroat for the Queets River system. Tripp and McCart (1983) found that both young-of-the-year and older cutthroat trout populations were adversely affected by the stocking of coho fry. The greatest effects on the survival of cutthroat were associated with high coho stocking densities. Also, high densities and early stockings of coho fry slowed the growth of cutthroat fry, presumably as a result of interspecific competition. Hatchery-origin coho releases have occurred in the Queets River to supplement wild coho production (WDFW and WWTIT 1994). The hatchery fish consist of a mixture wild brood stock and introduced Quinault River hatchery stock. Currently, 110,000 coho smolts are stocked into the Queets annually. Wild coho brood stock fry and smolt releases have occurred in the Clearwater River basin where production consists of cultured wild brood stock. A non-native hatchery stock derived from a variety of brood sources has been introduced into the Salmon River. The hatchery coho program for the Salmon River calls for release of 800,000 smolts annually.

Hatchery winter steelhead smolts are released into the Salmon River (800,000 annually) and originate from Queets River and Quinault River stocks each year. Steelhead smolts are released into the mainstem and migrate downriver to the ocean quickly and therefore should have minimal impact on cutthroat populations. Juvenile steelhead move offshore soon after entering the ocean and begin to move northward as they move westward from the coasts of Oregon and Washington (Burgner et al. 1992). The rapid movement of juvenile steelhead to offshore waters reduces interspecific competition with anadromous cutthroat.



## **QUINAULT — RAFT/QUINAULT COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Raft/Quinault coastal cutthroat stock complex is thought to be distinct based upon the geographic distribution of its spawning grounds. The Raft River is an independent stream located north of the Quinault River and drains lowlands similar to those drained by north side tributaries of the Quinault River below Lake Quinault. Consequently coastal cutthroat trout in the Raft and Quinault rivers have been grouped into the same stock complex. The Raft and Quinault rivers are located within the Quinault Indian Nation Reservation and the Olympic National Park.

The number of genetically distinct stocks within the Raft/Quinault stock complex and the relationship of this complex to other stocks and stock complexes are unknown. Genetic sampling and analysis are needed to make these determinations, however no samples have been collected.

Anadromous and fluvial cutthroat are found in the mainstems and accessible tributaries as well as in the lake. Adfluvial fish are found in Quinault Lake, located at RM 33 on the Quinault River. Quinault Lake provides the opportunity for adfluvial fish to contribute to the anadromous life history form in this drainage. Resident cutthroat are expected to be found throughout the watershed, above barriers to anadromous fish, in most perennial tributaries.

Anadromous cutthroat enter the river from October through April (early and later entry), while spawning occurs from January through April. Fluvial and adfluvial fish spawn from January through March and resident fish early January through early April.

Stock origin is native with wild production.

### **STOCK STATUS**

The status of the Raft/Quinault stock complex is Unknown. WDFW does not conduct surveys on the Quinault Indian Reservation or in the Olympic National Park so no abundance or survival information is available. We expect that cutthroat densities are similar to those in near-by river systems with similar habitats.

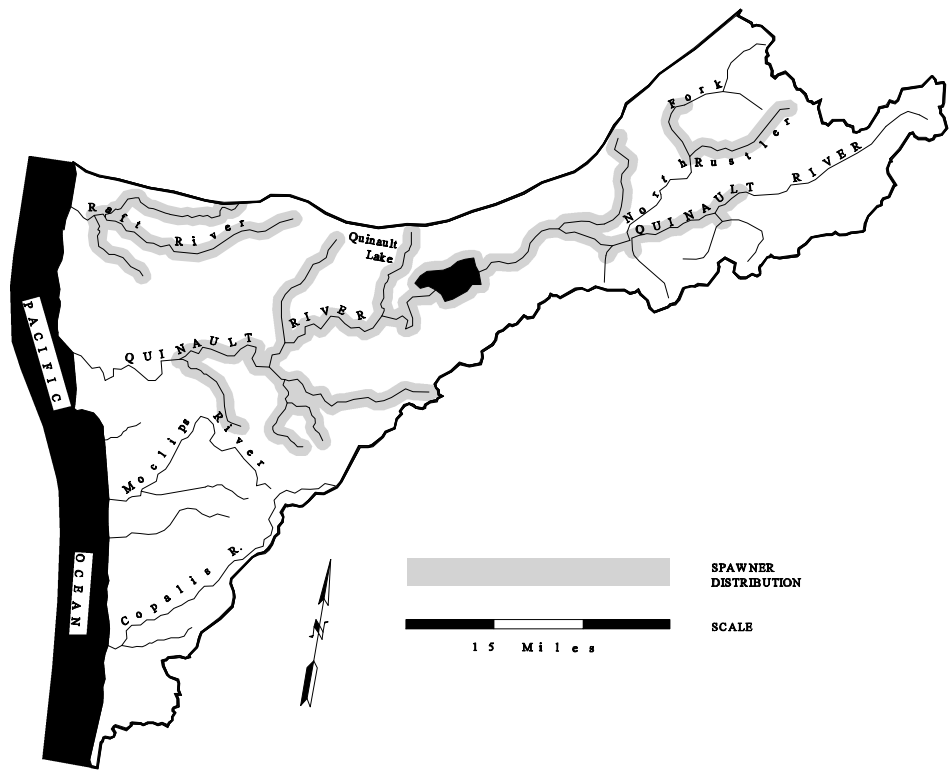
### **FACTORS AFFECTING PRODUCTION**

**Habitat**--The Quinault River has some of the best fish habitat on the coast of Washington State. Stream habitat above Quinault Lake is a braided mainstem with steep tributaries often accessible to anadromous fish only in their lower reaches. The

STOCK DEFINITION PROFILE for Raft/Quinault Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - YES



<b><u>TIMING</u></b>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	<b>DISTINCT?</b>
Anad Riv Entry													No
Anad Spawning													No
Fluvial Spawning													No
Adfluvial Spawning													No
Resident Spawning													No

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown



## STOCK STATUS PROFILE for Raft/Quinault Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

upper Quinault River drains a portion of the west side of the Olympic Mountain range and is located almost entirely within the Olympic National Park.

Below the lake the watershed lies within the Quinault Tribal Reservation. This region contains numerous tributaries many of which have been degraded by logging activities which have produced debris blockages and led to siltation of spawning grounds. WDFW knows very little about the current habitat conditions of these reservation waters.

**Harvest Management**--The on-reservation Quinault tribal regulations allow for the harvest of 12 cutthroat per day in the Quinault River and Cook Creek, a tributary located below Quinault Lake. A non-tribal anadromous cutthroat sport fishery does occur in Lake Quinault (on reservation). Most lower Quinault tribal and non-tribal fisheries are for salmon and steelhead. Above the lake, the off-reservation regulations allow harvest of two cutthroat per day over 14 inches in length to protect first-time anadromous spawners and some repeat spawners.

The sport and tribal fisheries for anadromous cutthroat in the Quinault River are not believed to affect the production of this stock complex.

**Hatchery**--No hatchery production of anadromous or resident cutthroat has been pursued by the Quinault Indian Nation or the state of Washington in the Quinault River watershed. The Quinault Tribe does release coho raised in the Quinault Nation Fish Hatchery, with an annual release of 600,000 fish released into Cook Creek. Hatchery steelhead smolts are released into Cook Creek (190,000), Quinault (200,000) and Salmon River (130,000). Steelhead smolts are expected to leave freshwater soon after release and to move quickly offshore. Consequently they are not expected to interact significantly with coastal cutthroat. Excess fry are stocked in the Raft River. Interactions between steelhead fry and coastal cutthroat have not been examined.

## **MOCLIPS/COPALIS — MOCLIPS/COPALIS COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Moclips/Copalis coastal cutthroat stock complex is thought to be distinct based upon the geographic distribution of its spawning grounds. Coastal cutthroat in the Moclips and Copalis rivers have been included in the same stock complex due to the proximity of the two streams and their habitat similarities. This stock complex also includes Wreck Creek and Joe Creek cutthroat, as well as those in independent tributaries to the north and south of the Moclips River. These streams represent a transition zone between the large rivers to the north and Grays Harbor to the south. Most of the Moclips River and Wreck Creek are located within the boundaries of the Quinault Indian Nation Reservation.

The number of genetically distinct stocks with the Moclips/Copalis stock complex and the relationship of this complex to other stocks and stock complexes is unknown. Genetic sampling and analysis are needed to make these determinations, however no samples have been collected.

Cutthroat are present in virtually all perennial tributaries and mainstem reaches of this system in one or more life history forms. The anadromous form inhabits mainstem and accessible tributary reaches, while the resident life history form is found both above and below anadromous barriers overlapping in distribution with anadromous fish.

Anecdotal information from local anglers suggests that the anadromous cutthroat in these streams may enter freshwater earlier than those in Chehalis/Grays Harbor streams to the south. River entry is thought to be nearly year-round, from June through April. Spawning by anadromous and fluvial life-history forms occurs January through March. Spawning of the resident form occurs from February through March.

Stock origin is native with wild production.

### **STOCK STATUS**

The status of Moclips/Copalis stock complex is Unknown. No quantitative data are available for assessing population trends. Anecdotal harvest information from local anglers suggests that this population is stable.

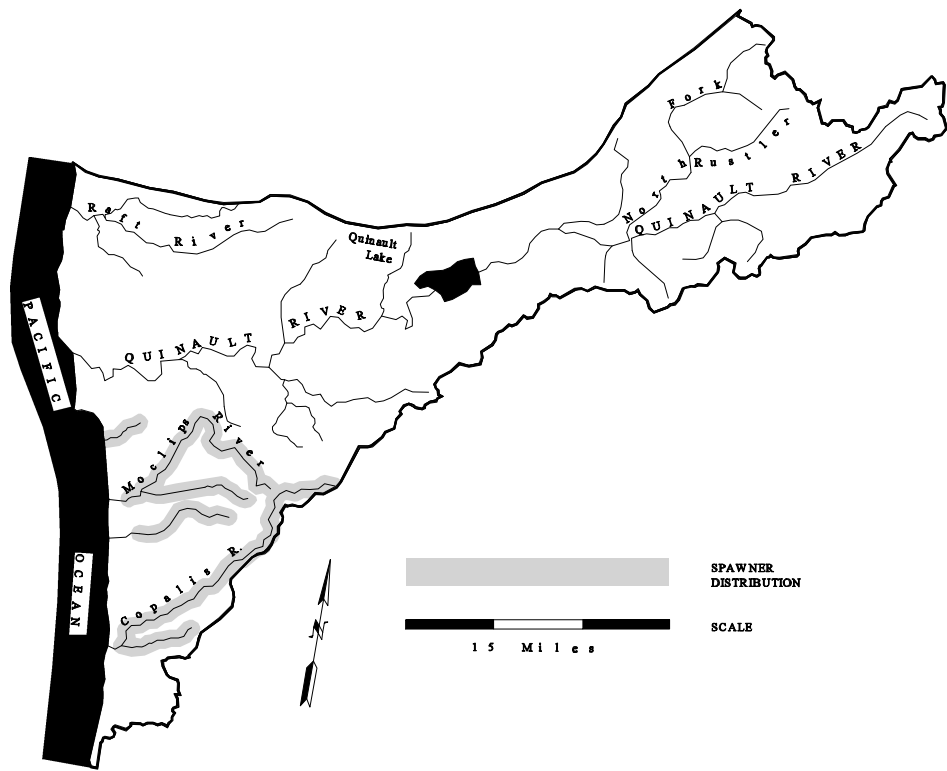
### **FACTORS AFFECTING PRODUCTION**

**Habitat**--The Moclips and Copalis rivers are small streams that drain lowland areas, generally under 500 feet elevation. The low gradient results in a significant amount of

STOCK DEFINITION PROFILE for Moclips/Copalis Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - YES



<b><u>TIMING</u></b>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	<b>DISTINCT?</b>
Anad Riv Entry													Yes
Anad Spawning													No
Fluvial Spawning													No
Resident Spawning													No

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Yes

## STOCK STATUS PROFILE for Moclips/Copalis Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

fine sediment in the substrate, often with sand predominating. Debris and log-jams are common in tributaries and upper mainstem areas.

The Moclips had a historic block at RM 1.3 that is now gone. Beaver Creek, a tributary of Joe Creek, an independent stream located between the Moclips and Copalis rivers, also has a blockage to upstream passage. For Moclips, we believe that the resident population has provided a source for anadromous re-establishment and has colonized accessible waters.

**Harvest Management**--The lower Moclips and Copalis rivers are popular with local anglers targeting anadromous cutthroat. Fisheries regulations are designed to minimize harvest impacts on wild production. The daily limit for cutthroat in the Moclips and Copalis drainages is two fish over 14 inches in length. This regulation is intended to permit most anadromous females to spawn at least once prior to harvest. No harvest data are available. Smaller tributaries require eight-inch minimum size limit for the protection of resident cutthroat, juveniles and outmigrating smolts.

**Hatchery**--No releases of hatchery-origin cutthroat have been made in the Moclips and Copalis rivers or associated streams. Hatchery-origin cutthroat may stray into these waters from the Chehalis Basin to the south, but that has not been observed.

## **GRAYS HARBOR — HUMPTULIPS COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Humptulips River coastal cutthroat stock is believed to be distinct based on its geographic spawning distribution. Grays Harbor is one of the largest estuaries on the west coast of North America and is fed by the Humptulips and Chehalis rivers.

It is possible that cutthroat from the Humptulips River should be included in the Chehalis cutthroat stock complex, but genetic information is lacking to make this determination. Genetic sampling of cutthroat from several south coastal tributaries including the Humptulips was conducted during 1995 as part of a coastwide genetics survey of coastal cutthroat by Washington, Oregon and the National Marine Fisheries Service (NMFS). The Humptulips sample was collected by Oregon State University biologists in Stevens Creek, a tributary of the Humptulips, but the analysis was not compatible with those conducted by WDFW or NMFS, so results are not presented.

River entry by anadromous fish is from January through April (late entry). Spawning by anadromous and fluvial forms occurs January through April and from February through March for the resident form.

No population maturity data are available for this stock.

No hatchery-origin coastal cutthroat have been released into the Humptulips River, however there is some potential for interbreeding with hatchery-origin anadromous cutthroat derived from other native Grays Harbor stocks utilizing the intertidal zone of the Humptulips. The Humptulips stock is considered native and is sustained by wild production.

### **STOCK STATUS**

The status of the Humptulips stock is Unknown. Juvenile densities in Stevens Creek, a Humptulips tributary, are comparable to those of other major river tributaries sampled on the south coast. A local angler reports that the catch rate in Big Creek, a Humptulips tributary, is stable. Based on anecdotal information from local residents, cutthroat population size in the West Fork Humptulips is greatly reduced from historic levels. However, no quantitative data exist for many of these watersheds.

### **FACTORS AFFECTING PRODUCTION**

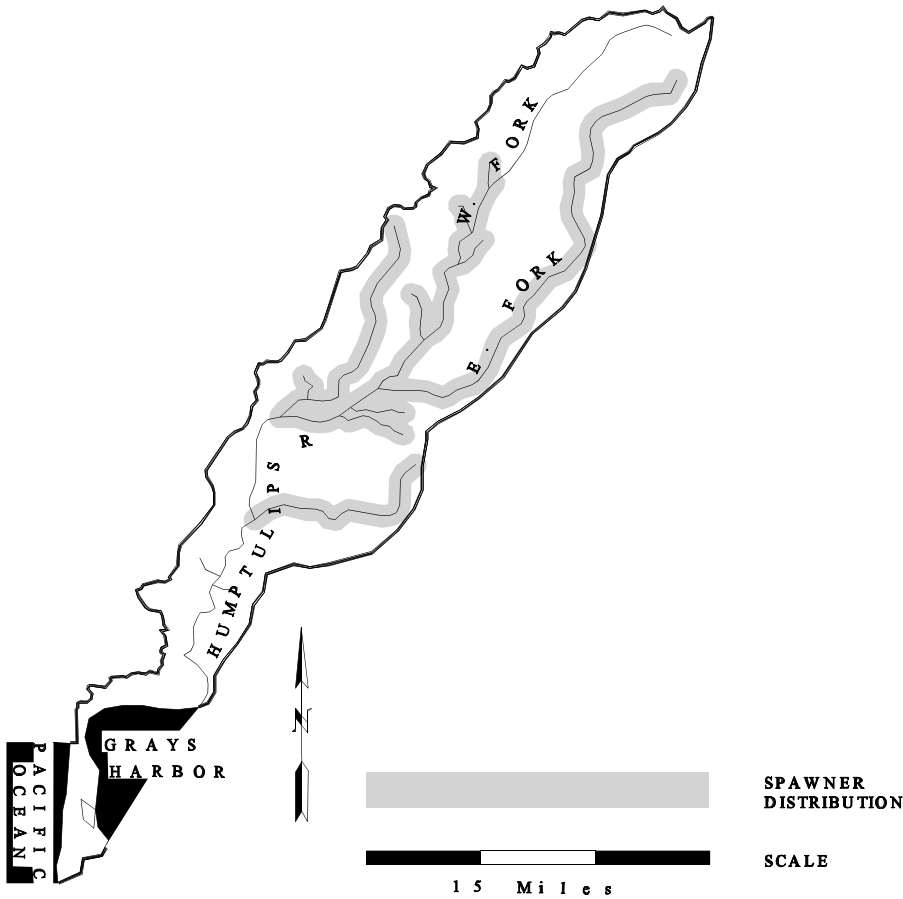
**Habitat**--Extensive logging has occurred in this drainage and subsequent siltation from logging and related activities probably has reduced production in several tributaries.

STOCK DEFINITION PROFILE for Humptulips Coastal Cutthroat

SPAWNER

DISTRIBUTION

DISTINCT? - YES



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT?
Anad Riv Entry	■	■	■	■	■	■	■	■	■	■	■	■	No
Anad Spawning	■	■	■	■	■	■	■	■	■	■	■	■	No
Fluvial Spawning	■	■	■	■	■	■	■	■	■	■	■	■	No
Resident Spawning		■	■	■	■	■	■	■	■	■	■	■	No

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown



## STOCK STATUS PROFILE for Humptulips Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

Both anadromous and resident cutthroat spawn in small headwater tributaries that are sensitive to siltation.

**Harvest Management**--Fisheries regulations are designed to minimize harvest impacts on wild production. The daily limit on the Humptulips River is two fish over 14 inches. This regulation is designed to allow anadromous females to spawn at least once before being subject to harvest. The Humptulips has a historic reputation as an outstanding anadromous cutthroat stream. Prior to the current regulation, excessive harvest sometimes occurred. Little is known about current harvest impacts on resident cutthroat except that hooking mortality is approximately 50 percent when baited hooks are used.

**Hatchery**--There is no hatchery program for anadromous or resident cutthroat on the Humptulips River. Hatchery-origin anadromous strays from other streams entering Grays Harbor could utilize the intertidal zone of the Humptulips. Approximately 2.0 million hatchery-origin coho are released annually into the Humptulips. The majority of coho are released as smolts (1.8 million) while the remainder are eggs transfers and fry releases. Interactions between hatchery coho and wild Humptulips cutthroat have not been examined, however larger coho juveniles may compete with smaller cutthroat juveniles. Both summer and winter steelhead smolts are also released. The annual stocking goal for summer fish is 30,000 smolts and the winter steelhead goal is 150,000 smolts. Steelhead smolts are expected to migrate quickly to the ocean and then to move offshore, minimizing competition with anadromous cutthroat.

## **GRAYS HARBOR — CHEHALIS COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Chehalis coastal cutthroat stock complex is considered distinct based on the geographic distribution of its spawning grounds. The Chehalis coastal cutthroat stock complex includes cutthroat in Johns, Hoquiam, Wishkah, Wynoochee, Satsop, Black, Skookumchuck, and Newaukum rivers, as well as in smaller tributaries and headwaters of the Chehalis.

The number of genetically distinct stocks within the Chehalis complex and the relationship of this complex to other stocks and stock complexes are unknown. Because of the variety of habitat types available to cutthroat in the basin, there may be as much genetic variation within this stock complex as there is among other stocks complexes. Further genetic sampling and analysis are needed to make these determinations. Cutthroat from several sites in the Chehalis basin were sampled for genetic analysis in 1995 as part of a coast-wide genetics survey of coastal cutthroat conducted by Washington, Oregon, and the National Marine Fisheries Service. The Chehalis stock complex is represented by a collection from Wildcat Creek which was found to be significantly different from other South Coast collections.

Cutthroat are present in virtually all perennial tributaries and mainstem reaches of this system in one or more of their life history forms. The anadromous and fluvial forms inhabit mainstem and accessible tributary reaches. The resident form exists both above anadromous barriers and below where they mix with anadromous fish. Adfluvial fish are found in many lakes in the drainage.

River entry is from October through April (early and late entry). Spawning by anadromous and fluvial life history forms occurs from January through mid-March. Adfluvial fish spawn from March through mid-April, and resident fish spawn from February through mid-March.

Until recently the WDFW Aberdeen Hatchery maintained an anadromous coastal cutthroat broodstock derived from native Grays Harbor/Chehalis stocks. Consequently Chehalis coastal cutthroat are considered native with composite production.

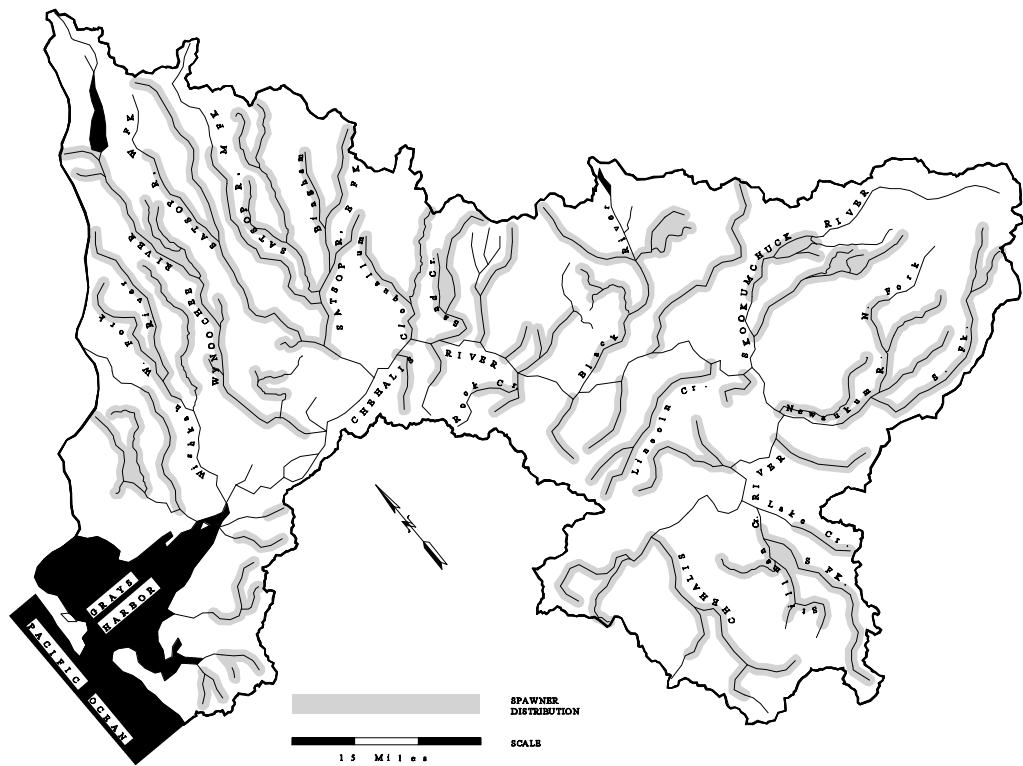
### **STOCK STATUS**

The status of the Chehalis stock complex is Unknown. However, based on juvenile density sampling in the upper basin conducted by the Weyerhaeuser Corporation and returns to the West Branch Hoquiam River trap operated by the Quinault Indian Nation, it is believed that cutthroat are relatively abundant and widely distributed.

STOCK DEFINITION PROFILE for Chehalis Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - YES

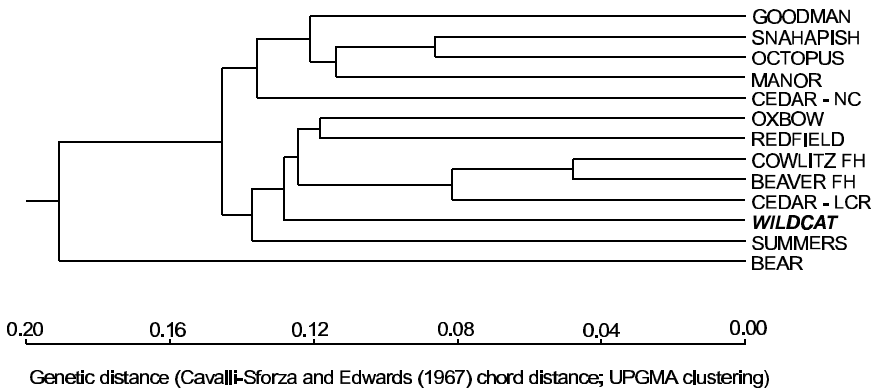


TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT?
Anad Riv Entry													Yes
Anad Spawning													No
Fluvial Spawning													No
Adfluvial Spawning													Yes
Resident Spawning													Yes

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

GENETICS - The Wildcat Cr. collection (N=25), made in 1995, was significantly different from other South Coast collections (33 allozyme-locus G-tests;  $P<0.001$ ).



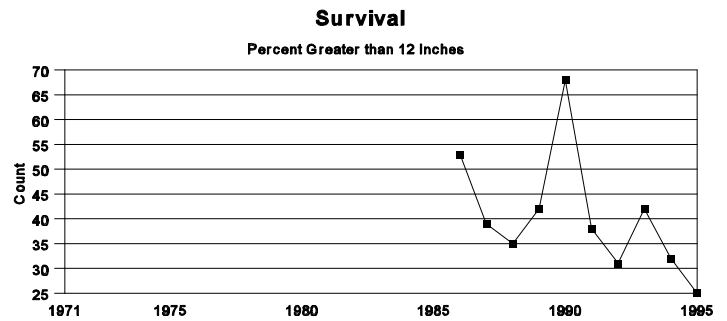
# STOCK STATUS PROFILE for Chehalis Coastal Cutthroat

## STOCK ASSESSMENT

DATA QUALITY -----> Good

Return Years	SURVIVAL % 12 in			
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1971	
1972	
1973	
1974	
1975	
1976	
1977	
1978	
1979	
1980	
1981	
1982	
1983	
1984	
1985	
1986	53
1987	39
1988	35
1989	42
1990	68
1991	38
1992	31
1993	42
1994	32
1995	25



## AVERAGE RUNSIZE DISTRIBUTION

Data not available.

## STOCK SUMMARY

Stock Origin

**Native**

Production Type

**Composite**

Stock Distinction

**Distribution**

Stock Status

**Unknown**

Screening Criteria

Weyerhaeuser has sampled more than eighty sites in the upper basin for species abundance. Cutthroat densities averaged between 0.22 and 0.23 fish/m<sup>2</sup> which is at or above levels observed in other watersheds in western Washington. The Chehalis cutthroat densities were consistently higher than those in the adjacent Willapa Basin. Trap data shown in the Stock Assessment section of the Stock Status Profile are the percent of wild fish over 12 inches long (sexually mature) caught in the trap. Preliminary results from the trap indicates some cutthroat do not spawn until they have attained a size of 16 inches.

## **FACTORS AFFECTING PRODUCTION**

**Habitat**--Several tributaries of Grays Harbor and the middle and upper Chehalis mainstem have experienced excessive siltation due to historic logging practices, road construction, urbanization and cattle grazing. Logging has severely damaged resident cutthroat spawning streams. Over-appropriation of surface waters for irrigation purposes has occurred in several middle and upper basin tributaries. Decades of wood pulp waste are a permanent part of the substrate in Grays Harbor, creating water quality problems and stress for all salmonids, including anadromous coastal cutthroat.

The middle portion of the Chehalis River mainstem is slow moving with very low oxygen levels in the warm summer months. Northern pikeminnow (squawfish) and suckers thrive in many areas of the Chehalis leading to high levels of predation on salmonid smolts.

Dams on the Skookumchuck and Wynoochee rivers have eliminated access to a high percentage of cutthroat spawning habitat in those upper watersheds. The Skookumchuck Dam eliminated access to about 95% of historic spawning grounds. The Skookumchuck trap is designed to trap steelhead so that they can be trucked around the dam. Cutthroat are not trapped successfully and consequently are not transported in large numbers above the dam.

Fish traps have also been built to transport salmon and steelhead above the Wynoochee Dam. However, as on the Skookumchuck, the traps are not sized for cutthroat and are therefore, of limited usefulness in supplying information on coastal cutthroat abundance.

**Harvest Management**--Most Grays Harbor tributaries require release of wild cutthroat, allowing the retention of only hatchery cutthroat with a minimum size of 12 inches. Exceptions to this rule include the Humptulips River and several mid- and upper tributaries of the Chehalis River. Within these waters the daily limit is two fish over 14 inches. In upper tributary waters, the statewide rule applies which has an eight-inch minimum size limit. This regulation is designed to help protect resident cutthroat, juvenile and outmigrating smolts.

**Hatchery**--The Lake Aberdeen Hatchery on the lower Chehalis produced about 25,000 anadromous cutthroat smolts annually from broodstock derived from Grays Harbor native stocks. That program was discontinued in 1999.

Cutthroat from the Beaver Creek Hatchery program (Elochoman River on the lower Columbia River) were released into the Skookumchuck River above the dam, until about 1979. These releases were made to enhance the opening-day sport fishery. Few hatchery-origin fish were expected to have contributed to the naturally spawning stock in the basin beyond the upper Skookumchuck watershed because most were caught in the fishery.

Tokul Creek (north Puget Sound) cutthroat were released into the Black River to enhance the resident trout fishery. This program was discontinued in 1990.

Major annual releases of winter steelhead smolts occur in the Wynoochee (176,200) and Skookumchuck (75,000). Other tributaries where winter steelhead are released include Johns (10,000), Hoquiam (10,600), Wishkah (18,400), Satsop (32,400) and Newaukum (9,000) rivers. Steelhead smolts tend to migrate rapidly to the ocean and then to more offshore which minimizes competition with cutthroat.





## **WILLAPA BAY — NORTH/SMITH CR/CEDAR COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The North/Smith Creek/Cedar coastal cutthroat stock complex has been identified as distinct based on the geographic distribution of its spawning grounds. The North River, Smith Creek and Cedar River enter the northern portion of Willapa Bay, the largest estuary on the west coast of the United States. The coastal cutthroat in these streams have been grouped in the same stock complex based on the proximity of the streams and their habitat similarities.

The number of genetically distinct stocks within the North/Smith Creek/Cedar stock complex and the relationship of this complex to other stocks and stock complexes are unknown. It is possible that all Willapa Bay stocks are closely related. Habitat characteristics of freshwater and saltwater zones for all streams in Willapa Bay are very similar, and the extensive intertidal environment within Willapa Bay provides ample opportunity for straying. One collection from this area has been made for genetic analysis (Redfield Creek) and proved to be genetically distinct from the Chehalis collection. Further sampling and analysis are needed to make more complete determinations of genetic relationships.

Coastal cutthroat are present in virtually all perennial tributaries and mainstem reaches of these drainages in one or more of their life history forms. The anadromous form inhabits mainstream and accessible tributary reaches. Resident fish exist both above and below anadromous barriers where they mingle with anadromous fish.

River entry runs from mid-September through April (early and late entry). Spawning of anadromous forms occurs from January through mid-March and from February through March for the resident fish.

Coastal cutthroat in this complex are native and are sustained by wild production.

### **STOCK STATUS**

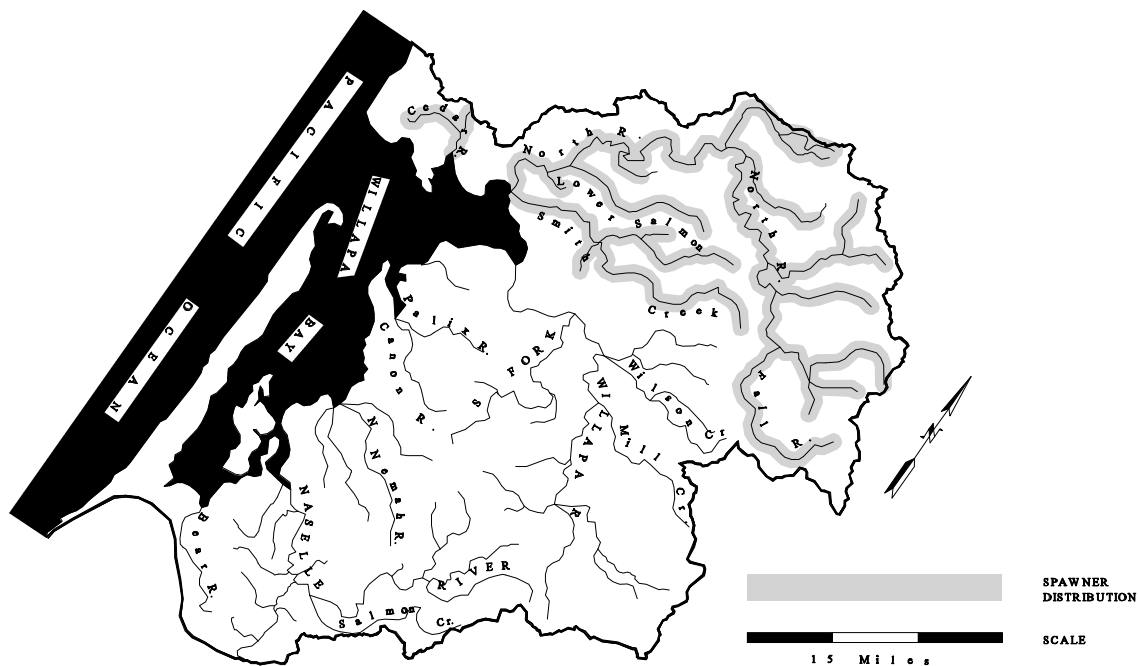
The status of the North/Smith Cr./Cedar stock complex is Unknown. No quantitative data have been collected within these drainages for trends in abundance or survival. Cutthroat densities have been estimated in the Willapa River basin and are similar to those in other western Washington watersheds.

Adult anadromous cutthroat were sampled at the three WDFW hatcheries located within the Willapa Harbor basin during 1995, 1996 and 1997/98. The Willapa, North Nemah, and Naselle rivers are represented in these samples and are thought to be

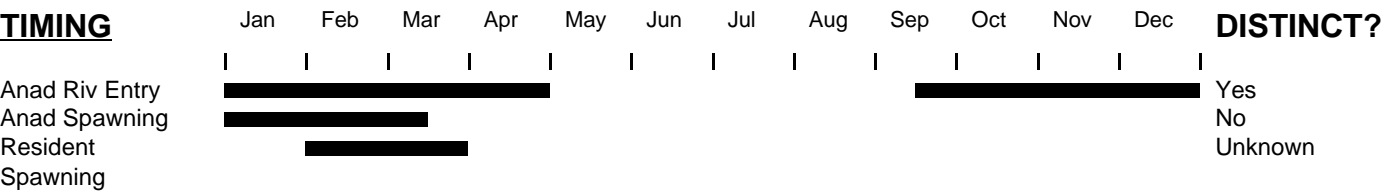
STOCK DEFINITION PROFILE for North/Smith Cr/Cedar Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - YES



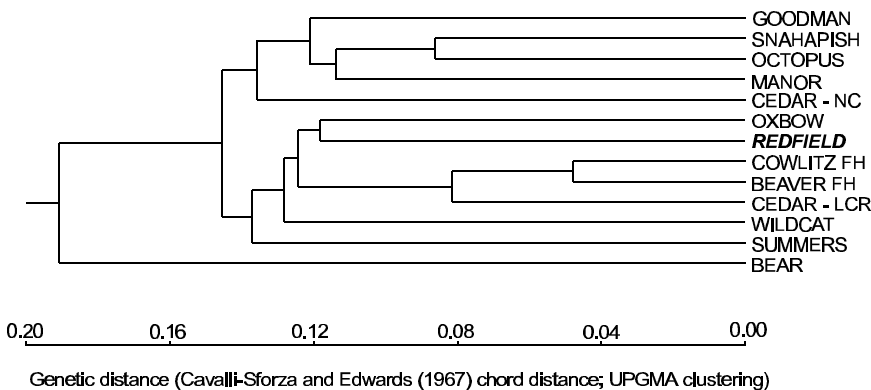
TIMING



BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

**GENETICS** - The Redfield Cr. collection (N=36), made in 1995, was significantly different from the other South Coast collections (33 allozyme-locus G-tests;  $P<0.001$ ).



## STOCK STATUS PROFILE for North/Smith Cr/Cedar Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

representative of the population structure throughout Willapa Harbor including the North River, Smith Creek, and the Cedar River. The data indicate that the population may have fewer repeat spawners than expected and that some of the population does not spawn until reaching 16 inches. Abundance of coastal cutthroat under 14 inches is good which indicates strong recruitment to the population. On the other hand, there has been extensive habitat damage in the North River and Smith Creek, and those components of the stock complex may be among the weakest in Willapa Bay.

## **FACTORS AFFECTING PRODUCTION**

**Habitat**--The North and Cedars rivers and Smith Creek enter Willapa Bay, the largest estuary on the west coast of the United States. Extensive intertidal zones and a rich semi-protected environment provide good habitat for anadromous cutthroat. Significant chum, coho and chinook runs are present in Willapa Bay tributaries, providing cutthroat with the opportunity to eat free-drifting salmon eggs during salmon spawning.

The use of the chemical "Sevin" by the oyster industry to kill ghost shrimp may have adversely impacted coastal cutthroat as this substance is concentrated into rivulets when the tide recedes in this extensive tideflat area.

The mainstem portions of these streams have little or no gravel for spawning use. The tributaries to the North River and Smith Creek have been adversely impacted by logging practices which have greatly reduced the amount of smaller clean gravel available for spawning.

**Harvest Management**--The sport fishery for coastal cutthroat in the North River and Cedar Creek is catch-and-release only. No commercial fishery occurs on this species in Willapa Bay. Statewide regulations apply to resident populations in non-anadromous waters. These rules require release of fish smaller than eight inches to protect resident fish, juveniles and outmigrating smolts.

**Hatchery**--There are no hatchery releases of anadromous cutthroat into Willapa Bay streams. About three percent of anadromous cutthroat trapped at the North Nemah Salmon Hatchery were of hatchery origin. These fish were probably from Grays Harbor or lower Columbia River anadromous cutthroat hatchery programs. No resident cutthroat releases are made into these waters. Steelhead smolts are released into these and surrounding tributaries, with 25,000 fish released into the North and South rivers, 25,000 into the Willapa River and 10,000 releases into Nemah River. Steelhead smolts tend to migrate quickly to the ocean and then to more offshore which minimizes competition with wild cutthroat. Coho releases also occur throughout the basin with 500,000 smolts going into each of the Willapa and the Nemah rivers and 100,000 into the Naselle River annually. Interactions between hatchery-origin coho smolts and wild cutthroat have not been examined.

## **WILLAPA BAY — WILLAPA COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

Coastal cutthroat in the Willapa River watershed have been identified as a distinct stock complex based on the geographic distribution of their spawning grounds. The Willapa River enters northern Willapa Bay at the town of Raymond.

It is possible that all Willapa Bay stocks are closely related. Habitat characteristics of freshwater and saltwater zones for all stream are very similar, and the extensive intertidal environment within Willapa Bay provides ample opportunity for straying. Samples for genetic analysis were taken from one site on Oxbow Creek, a Willapa River tributary. This collection was significantly different from other South Coast cutthroat collections. Additional genetic sampling and analysis are needed to make further determinations of cutthroat relationships within Willapa Bay.

Coastal cutthroat are present in virtually all perennial tributaries and mainstream reaches of these drainages in one or more of their life history forms. The anadromous and fluvial forms inhabit mainstream and accessible tributary reaches. Resident forms exist both above anadromous barriers and below them where they mingle with anadromous fish.

River entry is from mid-September through April (early and late entry). Spawning of the anadromous and fluvial fish occur January through mid-March and from February through March for resident fish.

Willapa coastal cutthroat are native and are sustained by wild production.

### **STOCK STATUS**

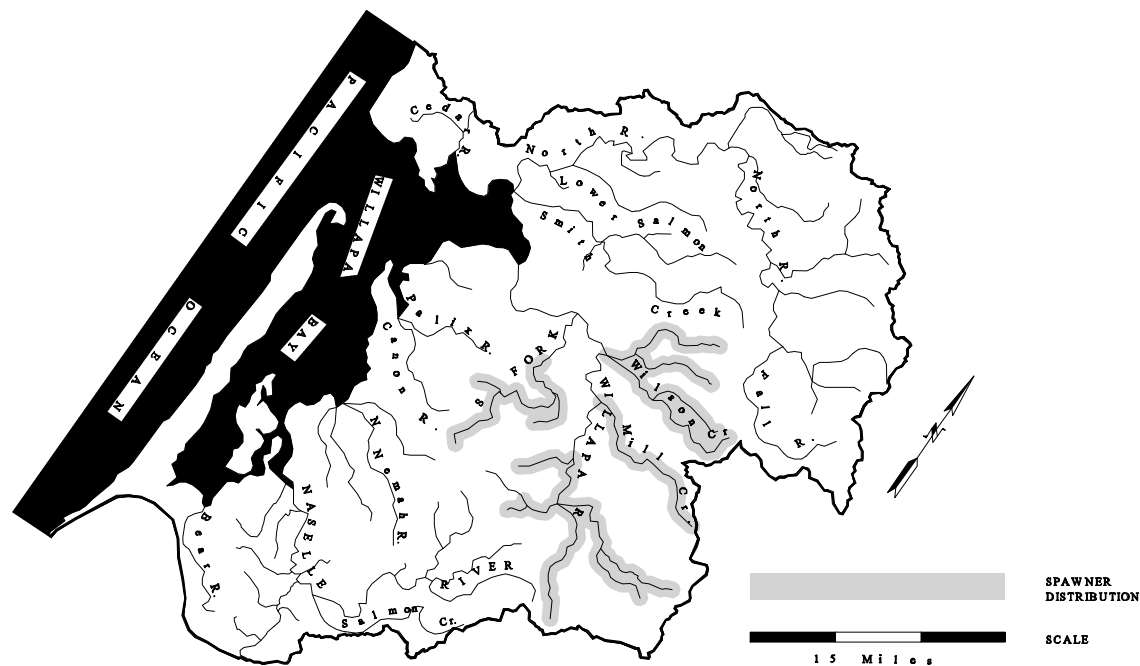
The status of the Willapa stock complex is Unknown. However, some information is available. The Weyerhaeuser Corporation has sampled more than 70 sites in the Willapa River basin in both anadromous and resident spawning and rearing areas. Cutthroat densities averaged from 0.09 to 0.13 fish/m<sup>2</sup>, which is similar to levels observed in other western Washington watersheds. However, these densities were lower than those observed in the upper Chehalis basin.

Adult anadromous cutthroat were sampled at the three WDFW hatcheries located within the Willapa Harbor basin during 1995, 1996, and 1997/98. The Willapa, North Nemah, and Naselle rivers are represented in these samples and are thought to be representative of the population structure throughout Willapa Harbor. The data indicate that the population may have fewer repeat spawners than expected and that some of the population does not spawn until reaching 16 inches. Abundance of

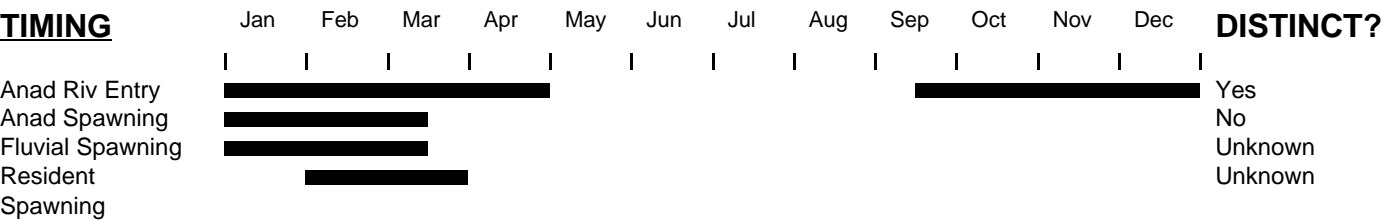
STOCK DEFINITION PROFILE for Willapa Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - YES



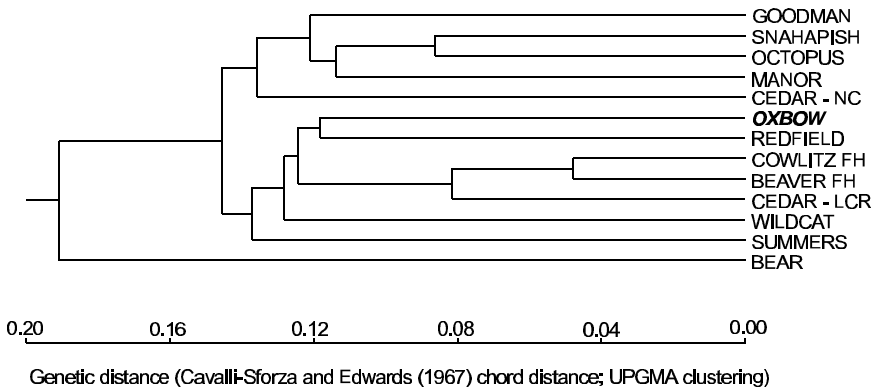
TIMING



BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

**GENETICS** - The Oxbow Cr. collection (N=26), made in 1995, was significantly different from other South Coast collections (33 allozyme-locus G-tests;  $P<0.001$ ).



## STOCK STATUS PROFILE for Willapa Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

anadromous cutthroat under 14 inches is good which indicates strong recruitment to the population.

## **FACTORS AFFECTING PRODUCTION**

**Habitat**--The Willapa River enters Willapa Bay, the largest estuary on the west coast of the United States. Extensive intertidal zones and a rich semi-protected environment provide good habitat for anadromous cutthroat. Significant chum, coho and chinook runs are present in Willapa Bay tributaries, providing cutthroat with the opportunity to eat free-drifting salmon eggs during salmon spawning.

The use of the chemical "Sevin" by the oyster industry to kill ghost shrimp may have adversely impacted coastal cutthroat as this substance is concentrated into rivulets when the tide recedes in this extensive tideflat area.

Small tributary streams in this drainage have been severely damaged by logging activities, impacting both resident and anadromous spawning areas with siltation and high flows which wash away smaller suitable gravels.

**Harvest Management**--Fisheries regulations are designed to minimize harvest impacts on wild production. The sport fishery in these Willapa Bay streams is catch-and-release (except hatchery steelhead) to protect cutthroat and wild steelhead. No commercial fishery exists on this species in Willapa Bay. Above anadromous waters, statewide regulations apply, with a minimum size of eight inches.

**Hatchery**--No hatchery releases of cutthroat are currently made into Willapa Bay tributaries. A small number of hatchery-origin smolt releases were made historically into this basin. About three percent of the cutthroat sampled at the North Nemah Hatchery were of hatchery origin. It is thought that these fish have migrated to Willapa Bay from Grays Harbor or lower Columbia River hatchery programs. Hatchery steelhead and coho are released into various Willapa tributaries. Annual releases of 25,000 steelhead smolts are made in the North and South rivers, along with 10,000 into the Nemah River annually. Steelhead smolts tend to migrate quickly to the ocean and then to more offshore which minimizes competition with wild cutthroat. Approximately 500,000 coho smolts are released into the Willapa and Nemah rivers and 10,000 into the Naselle River. Interactions between coho smolts and wild cutthroat have not been examined.



## **WILLAPA BAY — MID-WILLAPA BAY COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Mid-Willapa Bay stock complex has been identified as distinct based on the geographic distribution of its spawning grounds. This stock complex consists of coastal cutthroat in the Nemah, Canon, Palix and Niawiakum rivers which are small tributaries entering the middle portion of Willapa Bay. Coastal cutthroat spawning in these streams have been grouped in the same stock complex based on the proximity of the streams and their habitat similarities.

The number of genetically distinct stocks within the Nemah/Canon/Palix/Niawiakum stock complex and relationship of this complex to other stocks and stock complexes are unknown. It is possible that all Willapa Bay stocks are closely related. Habitat characteristics of freshwater and saltwater zones for all streams are very similar. The extensive intertidal environment within Willapa Bay provides ample opportunity for straying. Further genetic sampling and analysis are needed to make these determinations.

Coastal cutthroat are present in virtually all perennial tributaries and mainstem reaches of these drainages in one or more of their life history forms. The anadromous form inhabits mainstem and accessible tributary reaches. Resident forms exist both above anadromous barriers and below them where they mingle with anadromous fish.

Anadromous fish enter the river from mid-September through April (early and late entry). Spawning of anadromous and fluvial fish occurs from January through mid-March and from February through March for resident fish.

Mid-Willapa Bay coastal cutthroat are native and are sustained by wild production.

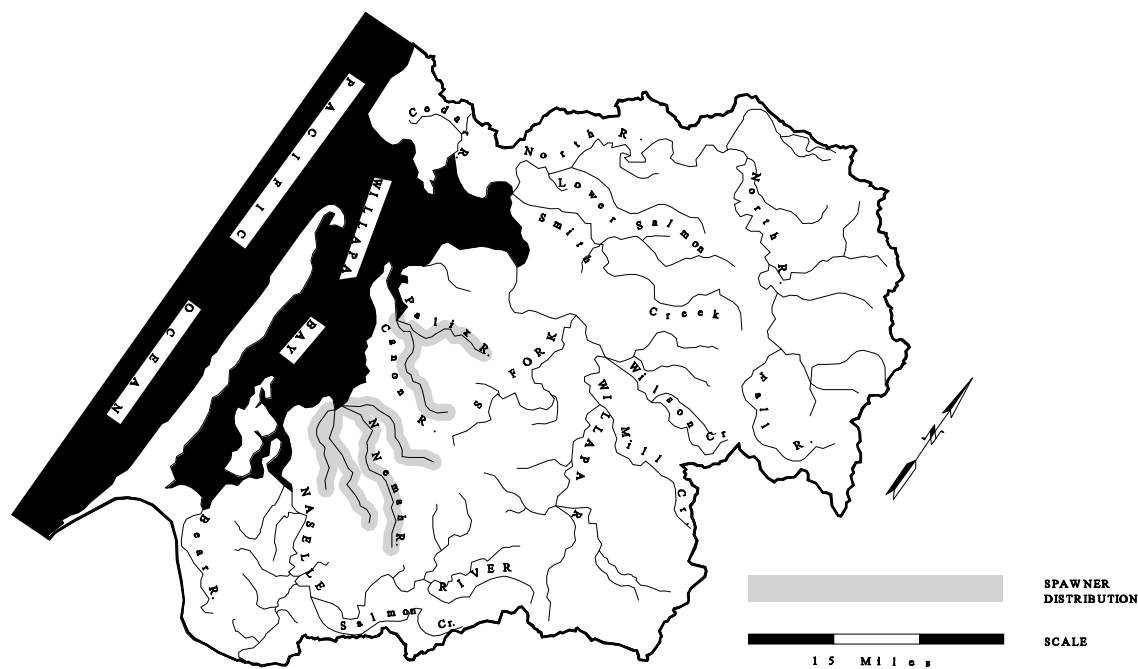
### **STOCK STATUS**

The status of Mid-Willapa Bay coastal cutthroat is Unknown. Adult anadromous cutthroat were sampled at the three WDFW hatcheries located within the Willapa Harbor basin during 1995, 1996 and 1997/98. The Willapa, North Nemah, and Naselle rivers are represented in these samples and are thought to be representative of the population structure throughout Willapa Bay including the Nemah, Canon, Palix and Niawiakum. The data indicate that the population may have fewer than expected repeat spawners and that some of the population does not spawn until reaching 16 inches. The abundance of coastal cutthroat under 14 inches is good which indicates strong recruitment to the population.

STOCK DEFINITION PROFILE for Mid-Willapa Bay Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - YES



<b><u>TIMING</u></b>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	<b>DISTINCT?</b>
Anad Riv Entry													No
Anad Spawning													No
Fluvial Spawning													No
Resident Spawning													No

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

## STOCK STATUS PROFILE for Mid-Willapa Bay Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

## **FACTORS AFFECTING PRODUCTION**

**Habitat**--Extensive intertidal zones and a rich semi-protected environment in Willapa Bay provide good marine habitat for coastal cutthroat. Significant chum, coho, and chinook runs are present in Willapa Bay, providing cutthroat on feeding runs the opportunity to eat free-drifting salmon eggs during salmon spawning.

However, use of the chemical "Sevin" by the oyster industry to kill ghost shrimp may have adversely impacted anadromous cutthroat as this substance is concentrated into rivulets when the tide recedes in this extensive tideflat area.

Most mid-Willapa headwater tributaries which provide resident and anadromous spawning habitat have been adversely impacted by logging activities which have increased fine sediment and washed away suitable gravels.

**Harvest Management**--Fisheries regulations are designed to minimize harvest impacts on wild production. The sport fishery in the Palix, Niawiakum, and Nemah rivers is catch-and-release to protect cutthroat and wild steelhead. There is no commercial fishery on cutthroat in Willapa Bay. Cutthroat in upper tributary waters, where resident fish occur, require release of fish under eight inches to protect resident fish, juveniles and outmigrating smolts.

**Hatchery**--No hatchery releases of cutthroat are currently made into Willapa Bay tributaries. A small number of hatchery-origin smolt releases were made historically into this basin. About three percent of the cutthroat sampled in 1995 at the North Nemah Hatchery were of hatchery origin, most likely strays into Willapa Bay and the Nemah River from Grays Harbor or lower Columbia tributaries. Both steelhead and coho smolts are released into Willapa Bay tributaries. There has been no evidence that these releases are detrimental to cutthroat populations.

## **WILLAPA BAY — NASELLE/BEAR COASTAL CUTTHROAT**

### **STOCK DEFINITION AND ORIGIN**

The Naselle/Bear coastal cutthroat stock complex has been identified as one of four stock complexes within Willapa Bay, based on the geographic distribution of its spawning grounds. The Naselle and Bear rivers enter the southern portion of Willapa Bay. Coastal cutthroat in these streams have been grouped into the same stock complex based on the proximity of the streams and their habitat similarities.

The number of genetically distinct stocks within the Naselle/Bear stock complex and relationship of this complex to other stocks and stock complexes are unknown. It is possible that all Willapa Bay stocks are closely related since habitat characteristics of freshwater and saltwater zones for all streams are very similar. The extensive intertidal environment within Willapa Bay provides ample opportunity for straying. Further genetic sampling and analysis are needed to make these determinations. Samples for genetic analysis were taken from cutthroat in Alder Creek, in the Naselle drainage, in 1995 as part of a coast-wide genetics survey conducted by Washington, Oregon and the National Marine Fisheries Service.

Coastal cutthroat are present in virtually all perennial tributaries and mainstem reaches of these drainages in one or more of their life history forms. The anadromous and fluvial forms inhabit mainstem and accessible tributary reaches. Resident forms exist both above anadromous barriers and below them where they mingle with anadromous fish.

River entry of the anadromous form occurs from mid-September through April (early and late entry), spawning of anadromous and fluvial fish occurs from January through mid-March. Resident fish generally spawn from February through March.

Naselle/Bear coastal cutthroat are native and are sustained by wild production.

### **STOCK STATUS**

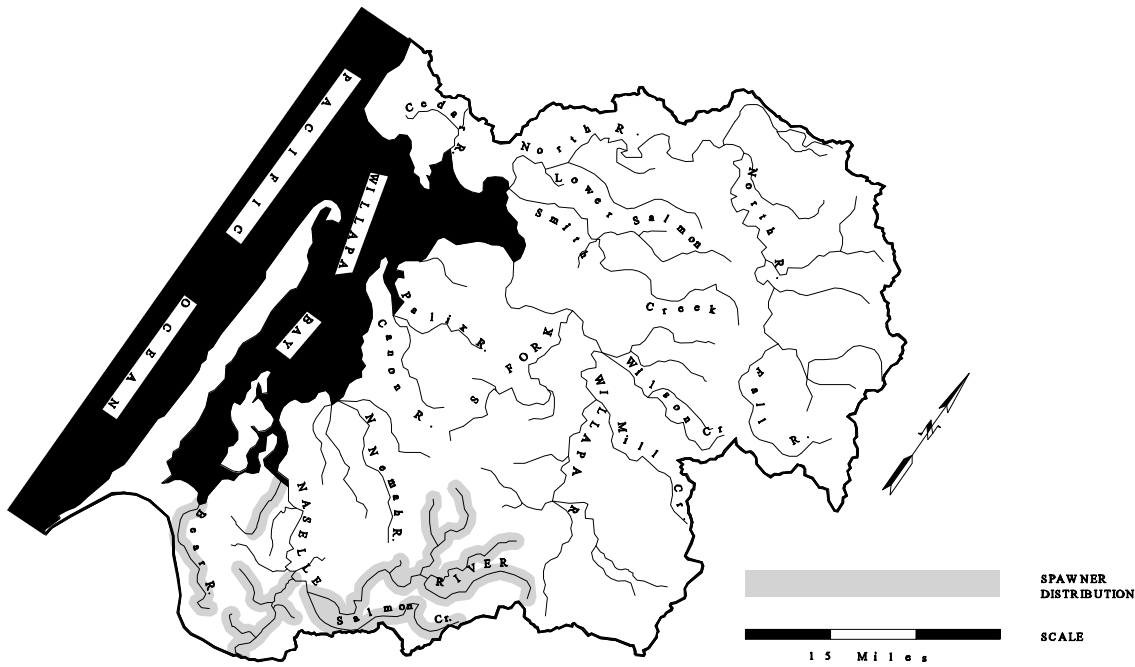
The status of Naselle/Bear coastal cutthroat is Unknown since insufficient quantitative data have been collected to identify trends for either abundance or survival. However, the abundance of cutthroat sampled in upper Alder Creek in 1995 was similar to that in other coastal streams.

Adult anadromous cutthroat were sampled at the three WDFW hatcheries located within the Willapa Bay basin during 1995, 1996 and 1997/98. The Willapa, North Nemah, and Naselle rivers are represented in these samples and are thought to be

STOCK DEFINITION PROFILE for Naselle/Bear Coastal Cutthroat

SPAWNER DISTRIBUTION

DISTINCT? - YES



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT?
Anad Riv Entry													No
Anad Spawning													No
Fluvial Spawning													No
Resident Spawning													No

BIOLOGICAL CHARACTERISTICS

DISTINCT? - Unknown

## STOCK STATUS PROFILE for Naselle/Bear/Coastal Cutthroat

### STOCK ASSESSMENT

DATA QUALITY -----> No Data

Return Years				
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### AVERAGE RUNSIZE DISTRIBUTION

Data not available.

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### STOCK SUMMARY

Stock Origin

***Native***

Production Type

***Wild***

Stock Distinction

***Distribution***

Stock Status

***Unknown***

Screening Criteria

representative of the population structure throughout Willapa Bay including the Naselle and Bear rivers. The data indicate that the population may have fewer than expected repeat spawners and some of the population does not spawn until reaching 16 inches. Abundance of anadromous cutthroat under 14 inches is good which indicates strong recruitment to the population.

## **FACTORS AFFECTING PRODUCTION**

**Habitat**--Extensive intertidal zones and a rich semi-protected environment within Willapa Bay provide good habitat for anadromous cutthroat. Significant chum, coho and chinook runs are present in Willapa Bay, providing cutthroat the opportunity to eat free-floating salmon eggs during salmon spawning.

The use of the chemical "Sevin" by the oyster industry to kill ghost shrimp may have adversely impacted sea-run cutthroat as this substance is concentrated into rivulets where cutthroat reside when the tide recedes in this extensive tideflat area.

Extensive logging in headwater areas has damaged those small streams where resident and anadromous cutthroat spawn.

**Harvest Management**--Fisheries regulations are designed to minimize harvest impacts on wild production. The sport fishery in these Willapa Bay streams is catch-and-release to protect cutthroat and wild steelhead. There is no commercial fishery on cutthroat in Willapa Bay. Resident cutthroat in upper tributary waters are protected with an eight- inch minimum size limit.

**Hatchery**--No hatchery releases of cutthroat are currently made into Willapa Bay tributaries. A small number of hatchery smolt releases was made historically into this basin, but the program has since been discontinued. Coho and steelhead smolts are released from various hatcheries throughout the basin, but interactions with native cutthroat have not been examined.